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COMMENTS ON THE IMPACT OF SEISMIC
OPERATIONS ON WILDLIFE IN THE N.W.T.

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COMMENTS ON THE IMPACT OF SEISMIC EXPLORATION
ON WILDLIFE IN THE NORTHWEST TERRITORIES

Prepared testimony for the Mackenzie Valley Pipeline Hearings

• Abstract - The ability to manage the impact of seismic exploration on wildlife is considered in light of the data currently available on the effects of various forms of disturbance. It is demonstrated, that the data currently available is largely based on the gross observable response of wildlife, rather a detailed understanding of the short and long term impact of this on the various species populations. In most cases, recommendations to minimize short term impact, can be provided to the Land Use Administration. However, there is the possibility of long term negative impact occurring in certain instances due to lack of adequate data. This is compounded by the practice of reviewing individual applications in isolation of other exploration programs and that the Land Use Advisory Committee does not have the authority to initiate research to obtain the basic data required to completely manage seismic exploration.

If seismic exploration is to be adequately managed to minimize short term impact and avoid long term impact, it is necessary to initiate research which defines the net effect of certain disturbances of wildlife and based on this knowledge, manage programs in consideration of the cumulative effects of exploration on wildlife populations.

I. Introduction

In this resumé of the impact of seismic exploration on wildlife, I will review the data that is currently available on the subject, outline what data is required to regulate the activity to protect wildlife, and I will indicate the management procedures that can be recommended at this time. These comments are restricted to terrestrial mammals, including semi-aquatic furbearers, as I am concerned primarily with those species.

The direct impact of seismic exploration on wildlife is managed by the Department of Indian and Northern Affairs via the Land Use Regulations. The Land Use Advisory Committee provides recommendations to the Chairman who has the authority to issue a permit authorizing the program. The Fish and Wildlife Service has the mandate to manage only indirect impact related to industrial activities.

Any direct impact that occurs, is the result of the various components of the seismic program which may include the following:

1. Aerial reconnaissance of the proposed program.
2. Movement of the equipment and camp into place.
3. Surveying of the seismic lines.
4. Clearing of the cutline (if in the treeline).
5. Drilling the shot holes along the seismic lines.
6. "Shooting" (blasting) and recording.
7. Vehicular traffic by the various crews (surveyors, drillers, etc.).
8. Air and/or ground support to the seismic party providing resupply and crew changes.

II. What is currently known on the impact of seismic exploration on wildlife

In reviewing the literature pertaining to furbearers, it quickly becomes apparent that there is very little directly related data available. Urquhart (1971, 1973) of the N.W.T. Fish and Wildlife Service, carried out a study of the impact of oil exploration on Banks Island between 1970 and 1972. Based on limited observations of disturbance (during capture attempts) at fox dens and similar experiences by Speller, Urquhart felt that ". . . when natural food is abundant, denning foxes can withstand a high level of temporary harassment at the den site.". There is, however, no quantitative data on which to base this statement.

In an attempt to determine the degree of association of foxes with seismic camps, Urquhart collected resighting data on marked foxes. He noted that the Camps would hold the foxes in the vicinity temporarily, and stated ". . . the effect on the population so far, appears to be negligible", at least, in years of high fox population.

I am not aware of any data in the literature which permits an evaluation on the impact of seismic exploration on other carnivorous furbearers.

The possibility of direct disturbance, to semi-aquatic species of mammals in particular, does exist as a result of blasting. This concern has been raised repeatedly by the residents of the Mackenzie Delta. Martin (1973), of the Fish and Wildlife Service, carried out studies in conjunction with a



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conventional seismic program and obtained no evidence to indicate that the integrity of pushups had been effected, nor that there was any physical damage or direct mortality to muskrats as a result of the program. However, this experiment cannot be considered as providing conclusive evidence that there was no negative impact due to the limitations of the study.

The potential direct impact of seismic programs on large carnivores (black, grizzly and polar bears) are results from conflict between bear and man at camp sites, disturbance at den sites, and harassment of the bears by aircraft. Although most seismic programs are conducted during the period in which black and grizzly bears are in dens, a period of overlap does exist when the grizzlies are active in the spring. It is known that grizzly bears react strongly to disturbance from aircraft (McCourt et al, Surrendi and DeBock). The data are largely a result of incidental observations and far from complete. The same is true with polar bear, although again, the chance of disturbance from seismic related support flights is probably not great at this time as most programs are land based.

I am not aware of any data that indicates the degree of disturbance that will be tolerated by grizzly bear or polar bear in the vicinity of their dens, that could be used to adequately mitigate against potential disturbance by seismic programs. In addition, there are currently no effective deterrents to avoid bear/man conflict at this time, other than man avoiding areas frequented by bears.

To comment on the data available relevant to the impact of seismic exploration on ungulates, it is necessary to review the various forms of disturbance that could occur as a result of each of the activities associated with a program (i.e.: reaction to presence of seismic lines and access trails and potential disturbance resulting from vehicular traffic, air traffic and noise associated with blasting).

Urquhart provides some relevant information on caribou from Banks Island. These caribou are considered to be an intergrade species between barren-ground and Peary caribou. He made observations of the reaction of the caribou to seismic related activities primarily during the fall of 1970. It should be noted that provision was not made for the use of exploration equipment in experimental situations, but rather the observations resulted from chance encounters between caribou and the equipment, camps, and seismic lines. His observations indicated there was a limited reaction to the presence of a camp. Caribou seldom approached within two miles of camps located in open areas during the day, but they did approach closer during the night. In hilly areas they appeared nearer the camps, probably because the hills masked sounds and smells. McCourt et al, noted only a very local avoidance of an inactive camp on the mainland (caribou passed within 200 yards). Urquhart also noted variable but limited response by caribou to the approach of seismic equipment ("reactions varied from running off at the sound of vehicles, to passively watching the vehicles pass within one

half mile or less"). These observations, however, were made primarily during the rut when response to disturbance may differ considerably from other seasons.

Slaney (1974, 1975) commented on the reaction of Peary caribou to vehicles and blasting associated with a program on Bathurst Island, however, the data was limited and inconclusive.

Urquhart indicated that the reaction of caribou on Banks Island to seismic lines was dependent on the degree to which the line had drifted with snow, thereby eliminating the raised edge of the line. He concluded that "seismic lines exert a 'local' influence on caribou distribution for some time after they (the seismic lines) had been used", though he indicated that it was unlikely that the lines would significantly interfere with migration routes. This was based on a "reconnaissance grid" seismic programs which are less intensive than detailed programs associated with delineating a geological formation. Main access roads were found to have a more profound impact on caribou movements. He noted that caribou did not actively use the seismic lines or access roads. Slaney on Bathurst Island (where the surrounding snow cover is sufficiently hard as to bear the weight of a caribou) did not note any preference for using or not using lines but the data may have been insufficient for any real comparison.

The reaction of caribou to the presence of cut lines in the treeline would appear to be variable. McCourt et al, noted that during mid-winter distribution, it was found that caribou used

lines where there had been vehicular traffic, probably due to shallower snow and relative ease of movement. Physically, this is obviously a different situation than in the tundra regions. During spring migration, the animals were, as a rule, deflected along cutlines for fairly short distances when the angle of their movement was at 15 degrees or less variance with the direction of the cutline. The net effect (in terms of energy cost) of a single or series of such deflections was not provided, but has since been commented on by Geist (1975).

The amount of aircraft traffic associated with an individual seismic program could be termed as occasional. The response of caribou to fixed wing aircraft and helicopters has been noted by a number of researchers (McCourt et al, Calef et al). The data have usually been collected in the form of incidental observations using several categories of gross observable response as the criteria. McCourt et al, concluded that caribou reacted more strongly to a Bell 206 helicopter than a Cessna 185 at less than 300 feet but that there was no difference above that altitude and that the reaction to aircraft flights above 1000 feet was unpredictable but infrequent. They concluded that a relationship existed between group size and reaction to flights below 300 feet with the larger groups reacting most intensely. They suggested there appeared to be a difference seasonally but indicated their data was incomplete.

Calef et al, observed a "panic" reaction by less than 20% of the groups in response to an overflight below 200 feet but

no such reaction or "strong escape responses" as a result of aircraft flying at an elevation above 500 feet. At the latter elevation, they noted even mild escape responses dropped to a low level. They did note a different trend in behavior when the caribou were on the calving grounds and during cold weather. In both instances the relative occurrence of panic and strong escape responses was greater at all altitudes up to 500 feet. They found that reaction to helicopters at below 500 feet was less than that of fixed wing aircraft which differs from other observers (McCourt et al, Klein). They stated that the terrain type and vegetation type did not appear to affect the reaction of caribou to the disturbance but that there was a relationship to the activity of the caribou. Differing from McCourt's data, resting animals were less reactive.

Thus, the data available to date on various forms of disturbance to caribou that could be associated with seismic programs is not completely in agreement and is based on only immediate and gross observable response.

In his studies of the impact of oil exploration on muskox, Urquhart indicates that based on limited observations, muskox herds may abandon areas occupied by seismic exploration equipment. This reases the concern that muskox could be displaced to less desirable habitat. This would be particularly important during late winter and early spring when they can least afford it, due to being in a situation of negative energy balance (Hubert, 1974).

Klein, D.R. 1973. The Reaction of Some Northern Mammals to Aircraft Disturbance. Proc. XI. International/9
Cong. of Game Biologists, Stockholm. 15pp.

Observations by Urquhart, Slaney, and Beak would indicate no observable response by muskoxen to the seismic operation, presence of camps and aircraft support flights. Gray (1972) in discussing disturbance states "Buzzing or circling by helicopters and fixed wing aircraft seems to be most harmful of man's activities". Further, that "This type of disturbance must have a deleterious effect on the weaker animals in the herd; old bulls, pregnant cows or those in poor condition". Urquhart indicated that the effect of aircraft disturbance depends on the season and topography and that individuals may be injured and calves abandoned if aerial harassment occurs in April and May. Again, the data is based largely on immediate and observable response providing no quantitative data on which to base specific recommendations with any degree of accuracy or certainty.

I am not aware of any studies that specifically address the question of behavioral response of moose to seismic exploration. Geist, in his reference to the anticipated effect of gas lines, states "in the case of moose, a good argument can be made that firstly, relatively few animals will be affected, and, secondly - and most importantly - the biology of moose is such that the population will soon recover from ill effects after a particular agent of harassment ceases to exist". Although seismic activity encompasses a broader area, the duration of the activity is likely to be less intense and shorter in duration if we assume the program progresses at the normal rate. In general, the natural plant succession associated with regrowth on the cutlines

usually constitutes habitat improvement for moose.

Extensive seismic programs have not been carried out nor are they likely to occur to a great extent in areas (i.e.: lambing areas and winter range) critical to the survival of Dall's sheep. However, aircraft disturbance associated with the support of seismic programs could occur to a limited degree. Data on the tolerance of sheep under varying conditions are limited and not adequate to provide precise guidelines for overflights of different types of aircraft (Simmons, pers. comm., Prescott, pers. comm.).

III. What we need to know about the impact of seismic related activities

To adequately evaluate both the impact of seismic exploration on arctic fox to date or adequately mitigate against it in the future, it would be necessary to determine:

1. The level and effect of disturbance of natural activities of fox in the vicinity of den sites associated with the presence of a seismic camp, aircraft overflights and vehicular traffic during the breeding season and during the period in which young are reared.
2. If any physical alteration of den sites occurs as a result of traffic by surface vehicles, should it be demonstrated that the physical integrity of dens is important to the production and survival of young.

In addition, it is necessary to determine all areas where there are relatively high densities of den sites where seismic

has, or is, likely to occur. If 1. above is density dependant, then it would be necessary to be aware of the relative abundance of fox and prey species.

To evaluate impact on other carnivorous furbearers similar information would be required, but in consideration of the biology of the various species, it would likely be a less productive exercise. The impact to habitat within the treeline has been more considerable but perhaps is not significant in terms of the habitat available to the species population. In certain instances the habitat alteration may result in beneficial impact.

To fully understand the direct impact on muskrats of blasting associated with a conventional seismic program further research is required to document any changes in reproductive success that may result. Experiments of a similar nature are required in co-operation with operators using unconventional techniques such as "multiplicity" seismic, which involves a higher degree of activity in a limited area.

To determine the impact of seismic programs on large carnivores (black, grizzly and polar bears) we must first determine the effects of related activities on the denning behavior of bears. It would then, also be necessary to know the location of den sites, or at least areas where dens occur frequently, in the vicinity of the activity.

Conflicts between bear and man in the vicinity of camps has been minimal to date primarily because of the operating season and the fact that the seismic programs have been largely

on land. Research is required to develop deterrents that are adequate to keep bears away from camps. Conflicts resulting from polar bear entering camps will likely increase without such deterrents if the amount of offshore seismic increases. A similar situation will result if a greater number of camps are occupied in the summer months for maintainance purposes in polar bear "summer sanctuaries" or in areas inhabited by grizzly and black bear.

To evaluate the impact of aircraft harassment on bears, quantitative data on the net effect of disturbance is required under varying conditions; however, the amount of aircraft associated with most programs is limited and not of the type (i.e.: low level) that would normally cause great disturbance to bears.

To determine the impact on caribou on the mainland and in the arctic islands, it is necessary to know the net impact of disturbance caused by all facets of the operation under varying conditions and the total of all such disturbances annually and over a period of years. The data provide some information on the observable response but no attempt has been made to measure quantitatively the net effect of this on individual caribou or herds. It is noteworthy that Urquhart, in relation to his own research on Banks Island, concluded "None of the studies have been able to supply information on the long term effects of oil exploration on caribou". And further, indicated that "studies on the behavior of caribou in relation to exploration

operations should be undertaken. Emphasis in such studies should be given to the influence on social behavior and in causing physiological stress". In Geist's critique (which has been tabled with this Inquiry) of the research carried out by McCourt et al on the response of caribou to cutlines, he states "the applicant has failed to provide adequate information on which to assess the effects of seismic lines on caribou migrations". Geist also indicates that the criteria that should be used for collecting data on aircraft harassment should be "in terms of physiology, reproduction, mortality and bioenergetics". Geist refers to the need to extend such research to be carried out in such a manner as to permit the creation of a predictive model on the effects of planned seismic lines on caribou migration, the delays incurred and data on the cost of locomotion on and off the lines. To provide completely adequate management recommendations relevant to seismic operations, the model suggested by Geist would have to be extended to include other forms of short term disturbance associated with an active program. This would include the effect of disturbance resulting from blasting, varying degrees of air and surface vehicular traffic and the presence of active camps. To evaluate impact it would be necessary to combine this with data on the population status of the herds and other limiting environmental factors that may exist. The latter is particularly valid in the arctic islands where apparently natural population fluctuations occur due to such factors as snow cover (Miller and Russell, 1974). A less

complex model, however, could mitigate against most significant forms of disturbance.

Many of the above comments relevant to the base of information required to recommend operating conditions apply to muskoxen. An obvious exception is that there is evidence which indicates negligible impact of new or old seismic lines on local movements of this species. It is necessary to determine quantitatively the energy expenditure resulting from varying forms and degrees of disturbance. This must be combined with available data on the range requirements of muskox to predict the impact of a single operation or series of seismic operations in a given area. Of particular importance is the matter of displacement (even if local) to less desirable habitat during late winter and early spring.

V. Can we recommend adequate procedures at this time?

It is evident that at this time it is possible only to recommend operating procedures to minimize impact.

In relation to arctic fox, the locations of most major denning areas are not known, nor is the effect of potential disturbance the den sites, Although under most conditions it is probably localized and not long term in nature. Thus, current management procedures may be adequate.

In relation to muskrats, the management procedures currently used in the delta for conventional programs of not permitting blasting within 20 feet of the lakes would appear to be adequate to prevent direct mortality or gross physical damage to muskrats. However, this does require verification, as does the potential

impact on subsequent reproductive success.

At this time it is only possible to provide management recommendations to minimize impact on bear. This can be accomplished primarily through avoidance of the few den sites and garbage incineration in an attempt to limit bear/man conflict in camps. Other measures in support of this, such as the limitation of one firearm per camp in control of supervisory personal, are also meant to limit the destruction of bears or other wildlife to a minimum. The establishment of a minimum flight elevation of 1500 feet above ground level and an anti-harassment clause are also meant to minimize disturbance but these are largely unenforceable. In most cases the data on denning sites are also inadequate. In addition, there is not adequate information to properly manage disturbance in the vicinity of the dens or adequate deterrants to eliminate bear/man conflict at camps.

The amount of information on seasonal movements and population estimates of caribou on the mainland and arctic islands has increased dramatically in recent years. As a result, it is possible in some cases to provide recommendations to minimize disturbance in critical (wintering and calving) areas and along spring migration routes. However, according to Geist the evaluation of impact is subjective, being based on observable response rather than a clear understanding of the actual stress that may be inflicted on the animals. Thus, using his criteria, it is only possible to provide recommendations at this time to limit gross observable indicators of stress in those areas where we have adequate knowledge of

population movements and distribution.

The short and long term impact on caribou of seismic activity, would appear to be unclear. This is particularly apparent in the boreal forest where cutlines exist for a considerable length of time as will the reaction to them and the resultant energy cost to females returning to calving grounds.

The amount of data on muskox numbers and distribution has also increased vastly since 1970, particularly in the arctic islands. It is possible to provide recommendations to reduce the interaction of seismic programs in areas of relatively high muskox density and during critical periods. This is usually accomplished by rescheduling work in specific areas and in some cases, recommending that operations cease early to avoid stressing muskox during late winter and early spring. Thus, as data are inadequate to provide clear and accurate guidelines conservative recommendations are often provided.

As impact cannot often be predicted, it cannot also be evaluated after the fact. Thus, monitoring of impact to check the adequacy of operating conditions is not possible. To understand the actual impact of seismic and to distinguish between short and long term impact, all factors (abiotic and biotic) must be understood and documented for specific populations. For example, the people of Resolute Bay have associated the decline of the caribou population on Bathurst Island with industrial activity. However, periodic population crashes are a well known fact of life in the arctic. The decline of muskox and caribou on Bathurst Island in 1973 and 1974, was attributed to excessive ice in the

snow cover (Miller and Russell, 1974). A die-off was recorded on Bathurst Island in the winter of 1967/68 prior to seismic activity on the island. In the former instance Miller and Russell state "There was no evidence on which to evaluate the effects of industrial exploratory activity on either species.". Thus, although the evidence appeared to indicate the problem was climatic, it could not be isolated as being purely that. Disturbance resulting from seismic and other exploratory operations could compound the situation for animals that may already be in a position of serious negative energy balance.

Summary

Specific data gaps have been identified as existing in relation to establishing the management procedures for all species. However, this does not mean that all seismic programs cannot be adequately regulated at this time to avoid significant and long term impact on the species. In relation to muskrats in the Delta controls on blasting would appear to at least minimize mortality even in the areas directly effected. Although the impact of activity in the vicinity of arctic fox dens is not understood, where concentrations of dens are identified they can be avoided in the spring. In any event, it is unlikely that a high proportion of dens would be in direct contact with seismic operations given the current intensity of seismic programs. In consideration of the biology of fox, it is unlikely to have great (long term) negative impact on this species which exhibits radical fluctuations in population under normal conditions.

The effect of direct disturbance to the behavior of other furbearers is also unlikely to cause long term impact. It would also appear unlikely that large scale habitat alteration has occurred. However, by reviewing and approving individual applications, the Land Use Committee does not have an adequate mechanism to consider the cumulative effects of a number of programs. If seismic activity intensifies in the Mackenzie Delta serious alterations may occur.

Similarly, there is potential for long term major impact to caribou that winter in the boreal forest. Current recommendations attempt to minimize disturbance to caribou but the long term effects of an increasing number of seismic lines is not understood in relation to winter range of the Porcupine and Bluenose herds.

Disturbance to muskox can be managed to avoid obvious problems but an evaluation of the adequacy of these measures is not possible at this time. As with caribou, the loss of a significant portion of cohorts within a herd could lead to long term impact.

Seismic camps can be managed to minimize conflict with bear however, an adequate deterrent is required to eliminate this problem, as is research to provide guidelines for managing activity in the vicinity of den sites.

To adequately manage all disturbance to wildlife resulting from seismic exploration, the Land Use Advisory Committee requires the authority to initiate research to provide adequate

operating limits for industry and to look at cumulative effects of all programs that could have impact on a wildlife population. Neither of these are currently the practice at present.

5 January 1976.

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C U R R I C U L U M V I T A E

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-Elementary and High School - Saskatchewan - completed 1963

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Relevant Professional Experience

-Summer 1965 - Technical Assistant - University of Alberta

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With the exception of the summer employment in 1965, all of the above positions have been with the N.W.T. Game Management Division which was transferred from the Federal to the Territorial Government in 1968 and became the Fish and Wildlife Service in 1975.

Within the latter role as Environmental Co-ordinator, I represent the Fish and Wildlife Service on:

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